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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the image formation equipment which used the electron emission element, especially the surface conduction type electron emission element.
[0002]
[Description of the Prior Art] Conventionally, two kinds, the source of a thermoelectron and a cold cathode electron source, are known as an electron emission element. There are a field emission type (it abbreviates to FE type hereafter), a metal / insulating layer / metal mold (it abbreviates to an MIM type hereafter), a surface conduction type electron emission element, etc. in a cold cathode electron source. an FE type example -- W.P.Dyke & W.W.Dolan, "Field emission", Advance in Electron Physicis, and 8 89 (1956) or -- It is indicated by C.A.Spindt, "Physical Properties of thin-film field emission cathodes with molybdenium", J.Appl.Phys., 47 5248, etc. (1976). an MIM type example -- C.A.Mead, "The tunnel-emission amplifier", J.Appl.Phys., and 32 646 (1961) etc. -- it is indicated
[0003] the example of a surface conduction type electron emission element -- M.I.Elinson, Radio Eng.Electron Phys., and 10 (1965) etc. -- it is indicated This surface conduction type electron emission element uses the phenomenon which an electron emits by passing current in parallel with a film surface to the thin film of the small area formed on the substrate. As this element, it is SnO2 by aforementioned Elinson etc. The thing using the thin film, thing [depended on Au thin film -- G. -- Dittmer : " -- Thin Solid Films and 9 317(1972)] In 2O3 / SnO2 thing [depended on a thin film -- M. -- Hartwell and C.G.Fonstad : -- "IEEE Trans.ED Conf." and 519] (1975) Thing [Araki **** by the carbon thin film: A vacuum, the 26th volume, No. 1, 22-page (1983)], etc. are reported.
[0004] As typical element composition of these surface conduction type electron emission elements, above-mentioned M. Hartwell's element composition is shown in drawing 15 . In this drawing, 201 is a substrate. 204 is a conductive thin film, it is formed in the pattern of H type configuration of the metallic-oxide thin film formed by sputtering, and the electron emission section 205 is formed of the energization processing called below-mentioned energization foaming. In addition, 0.5-1mm and W' are set as 0.1mm for the interval L of the element electrode in drawing. Since it was strictly unknown about the position and configuration of the electron emission section 205, it expressed typically.
[0005] with this energization foaming, impression energization of direct current voltage or the ****** (for example, about 1v/(minute)) carried out very slowly is carried out to the ends of the conductive thin film 204, and the conductive thin film 204 is destroyed, deformed or deteriorated locally -- making -- electric -- high -- it is forming the electron emission section 205 changed into the state [****] If voltage is impressed to the conductive thin film 204 of the surface conduction type electron emission element which carried out energization foaming processing and current is passed for an element, an electron will emit from near the crack formed in a part of conductive thin film 204.
[0006] Since structure is simple and manufacture is also easy structure, this surface conduction type discharge element has the advantage which can carry out array formation of many elements over a large area. The various application in which is followed, for example, these features, such as a source of an electric charge beam and image display equipment, can be employed efficiently is studied. In the image formation equipment using this electron emission element, the electron generated with the electron emission element is accelerated by acceleration voltage, and a picture can be formed by making the fluorescent substance prepared on the face plate irradiate.
[0007]
[Problem(s) to be Solved by the Invention] In such image formation equipment, the energy excluding the luminescence energy of light from the acceleration energy which an electron has is given to a fluorescent substance, and generation of heat occurs. Consequently, the temperature of the center section of the face plate is high, a temperature gradient called a low in the temperature of the periphery section arises, and a thermal strain, i.e., thermal stress, arises. In the conventional technology, meanses, such as thickening a composition member, were raising the rigidity of image formation equipment so that an envelope might not break with this thermal stress. Consequently, as for conventional image formation equipment, the weight was heavy comparatively.
[0008] image formation equipment this invention is made in view of the technical problem of such conventional technology, and using the electron emission element (especially surface conduction type discharge element) -- setting -- the temperature distribution in a face plate -- it can equalize -- the effect of thermolysis -- raising -- this result -- lightweight -- it aims at offering

the image formation equipment [-izing / equipment]
[0009]
[Means for Solving the Problem] The above-mentioned purpose of this invention has the face plate which carried the irradiated member which receives the electron which counters the electron-source substrate which has an electron-emission element at least, and the aforementioned electron-source substrate, is arranged, and is emitted from the aforementioned electron-emission element, and can attain it with the image-formation equipment characterized by to have a transparent electric-conduction membrane layer on the aforementioned image-formation field in the image-formation equipment of this face plate which has an image-formation field in part at least.
[0010]
[Embodiments of the Invention] Next, the desirable embodiment of this invention is shown.
[0011] Drawing 1 is the perspective diagram showing the image formation panel as one mode of the image formation equipment of this invention. In drawing 1 , 1 is an electron-source substrate in which an element electrode, an electron emission element, etc. are carried (not shown). the irradiation which receives the electron to which 2 is emitted from an electron emission element -- it is the face plate which has the image formation field 7 which is the portion which carries the fluorescent substance which is a member (not shown) and forms a picture by luminescence of this fluorescent substance in the center section The transparent electric conduction membrane layer by which a housing and 4 were prepared in the frit for sealing, and 5 was prepared for 3 on the image formation field 7 of the outside of a face plate 2, the envelope from which 6 was made by the electron-source substrate 1, the face plate 2, the housing 3, and the frit 4 for sealing, and 11 are the electric conduction membrane layers prepared on the same fields other than the image formation field of the outside of a face plate 2. Drawing 2 is the expansion outline cross section showing the transparent electric conduction membrane layer 5 prepared on the image formation field 7 of the outside of a face plate 2, and, as for a ground film and 9, 8 is [a transparent metal membrane and 10] the upper films.
[0012] This image formation equipment can be manufactured as follows. First, the electron-source substrate 1, a face plate 2, a housing 3, and the frit 4 for sealing are fixed with the fixture for fixation (not shown), baking sealing is carried out at predetermined temperature, and an envelope 6 is produced. Subsequently, on a face plate 2, the ground film 8 for using the transparent metal membrane 9 as a flat continuation film is formed, subsequently the transparent metal membrane 9 is formed, the upper film 10 for subsequently protecting the transparent metal membrane 9 is formed, and the transparent electric conduction membrane layer 5 of a sandwich structure is obtained. What is necessary is just to set without preparing an insulator layer beforehand on a face plate 2 about the portion which needs to be an insulation electrically or forming the transparent electric conduction membrane layer 5 in the portion.
[0013] Furthermore, in the mode shown in drawing 1 , it is the field of the outside of a face plate 2, and the electric conduction membrane layer 11 is formed on the same fields other than image formation field 7. Even when this electric conduction membrane layer 11 is transparent and it is opaque, it is good. Moreover, the efficiency of heat transfer can also be further improved by using the electric conduction membrane layer 11 as films (metal heat transfer membrane layer etc.) thicker than the transparent electric conduction membrane layer 5. Moreover, for example, the electric conduction membrane layer 11 can be used as the films (transparent metal heat transfer membrane layer etc.) of the same composition as transparent electric conduction **** 5, the electric conduction membrane layer 11 and transparent electric conduction **** 5 can be simultaneously formed as one, and a manufacturing process can also be simplified. As this electric conduction membrane layer 11, although a metal plating film is mentioned typically, it is not limited to this, for example, electrolysis or electroless plating, vacuum membrane formation, a vacuum deposition, a spatter, etc. can form membranes by any method. The component of the electric conduction membrane layer 11 has the nickel from the point of thermal conductivity and specific gravity, copper, aluminum, silver, desirable gold, etc. Especially, a non-electrolyzed nickel-plating coat, a non-electrolytic-copper plating coat, a non-electrolyzed composite-coatings coat, a vacuum evaporationo copper coat, etc. can be used suitably. Moreover, you may make it multilayer composition. The thickness of the electric conduction membrane layer 11 has 1 micrometer - desirable about 500 micrometers, and 10 more micrometers - its about 500 micrometers are desirable.
[0014] The transparency of the transparent electric conduction membrane layer 5 is not limited especially in this invention that what is necessary is just the transparency which is a grade from which the picture of requests, such as a luminosity, quality of image, etc. of a display image, is acquired. However, in a light field, about 50% or more of permeability is usually desirable, and about 80% or more of permeability is still more desirable.
[0015] In the mode of the transparent electric conduction membrane layer 5 shown in drawing 2 , gold, silver, an oxide-semiconductor transparent electric conduction film, etc. can use it suitably as a transparent metal membrane 9. Moreover, it is desirable to remove a lattice defect, an occluded gas, etc. and to raise thermal conductivity by annealing after membrane formation. The thickness of this transparent metal membrane 9 has 1nm - desirable about 1 micrometer, and 10 morenm - its about 100nm is more desirable.
[0016] Moreover, when using gold as a transparent metal membrane 9, oxides, such as Bi 2O3, In 2O3, ZrO2, Sb 2O3, and PbO, can be used as the ground film 8 and an upper film 10, and when using silver as a transparent metal membrane 9, you may use TiO2 and ZnS as the ground film 8 and an upper film 10. The thickness of this ground film 8 has 1nm - desirable about 300nm, and the thickness of the upper film 10 has 1nm - desirable about 300nm. Moreover, the thickness as the transparent electric conduction membrane layer 5 whole has 1nm - desirable about 1.5 micrometers, and 10 morenm - its about 300nm is more desirable. As these forming-membranes methods, although a spatter is mentioned typically, it is not restricted to this but the various well-known methods of forming other can also be adopted.

[0017] Such a transparent electric conduction membrane layer 5 functions by preparing on the image formation field 7 of a face plate 2 as thermolysis structure which does not need a space. That is, the heat generated with the fluorescent substance in the image formation field 7 can be promptly conducted in the 2nd page of a face plate, and temperature can be equalized. Furthermore, the efficiency of the thermolysis in a face plate 2 also improves, and thermal stress can be suppressed. Consequently, since the space which a composition member can be made thinner than conventional equipment, and a thermolysis means occupies is also small, lightweight-izing of equipment and sheet metal-ization are attained. Furthermore, in the mode shown in drawing 1 , since it has the electric conduction membrane layer 11 which touches the transparent electric conduction membrane layer 5 on fields other than image formation field 7 (that is, it connects thermally), equalization of temperature and improvement in thermolysis efficiency are promoted further.
[0018] In addition, although the transparent electric conduction membrane layer 5 and the electric conduction membrane layer 11 are one of what [the] also has the suitable transparent metal heat transfer membrane layer of composition of having been shown in drawing 2 in this invention, it is not limited to this but can be used without a limit of various kinds of electric conduction membrane layers which do so an operation of requests, such as equalization of above-mentioned temperature, and improvement in thermolysis efficiency. Moreover, in the mode shown in drawing 1 , although the transparent electric conduction membrane layer 5 was formed all over the image formation field 7 and the electric conduction membrane layer 11 was formed all over the same fields other than image formation field 7, it is not limited to this but you may form in the partial target instead of the whole surface according to a request.
[0019] Drawing 3 is the perspective diagram showing another mode of this invention. In drawing 3 , 12 is a radiation fin and has given the same sign about the same member as drawing 1 . As explained previously, after it produces an envelope 6, this image formation equipment forms the transparent electric conduction membrane layer 5 on the image formation field 7, further, forms the electric conduction membrane layer 11 in the lateral surface of the face plate 2 except the image formation field 7, the side, and the lateral surface and the side of a housing 3, and can manufacture it by fixing a radiation fin 12 on the electric conduction membrane layer 11 prepared in the side of a face plate 2, and the side of a housing 3. In case this radiation fin 12 uses image formation equipment so that thermolysis by the free convection may be performed good, it is good to install so that a radiation fin 12 may become almost parallel to gravity.
[0020] In the mode shown in drawing 3 , the electric conduction membrane layer 11 is prolonged to the side of a face plate 2, and the side of a housing 3, and since it has further the radiation fin 12 which touches the electric conduction membrane layer 11 of the portion (that is, it connects thermally), equalization of temperature and improvement in thermolysis efficiency are promoted further. In addition, although the configuration and number of radiation fins 12 are one of the examples also with what [suitable] is shown in drawing 3 in this invention, deformation various in the range from which it is not especially limited but an operation of requests, such as equalization of above-mentioned temperature and improvement in thermolysis efficiency, is obtained is possible.
[0021] Moreover, discharge-in-gases type image formation equipment is mentioned as another mode of this invention. The manufacture method is explained briefly below. First, an electric discharge plasma electrode and an electronic drawer electrode are arranged on a tooth-back board. Furthermore, the control electrode which consists of a band-like electrode group attached on the insulating base of a tabular is arranged. Then, it arranges and the face plate to which the fluorescent screen is attached is sealed so that a drawer electrode and parallel may be faced. And evacuation in image formation equipment is performed and discharge-in-gases type image formation equipment can be manufactured by enclosing the rare gas of a low pressure. The same effect is acquired also in such a mode.
[0022] In this invention, a surface conduction type electron emission element is suitable especially as an electron emission element carried in the electron-source substrate 1. Hereafter, this surface conduction type electron emission element is explained. As a surface conduction type electron emission element, two kinds, a flat-surface type surface conduction type electron emission element and a vertical-type surface conduction type electron emission element, are mentioned fundamentally. Drawing 4 is drawing showing the composition of a fundamental surface conduction type electron emission element, (a) is a typical plan and (b) is the cross section. For 201, as for an element electrode and 204, in drawing 4 , a substrate, and 202 and 203 are [a conductive thin film and 205] the electron emission sections.
[0023] As a substrate 201, it is glass with few impurity contents, such as quartz glass and Na, blue sheet glass, and SiO2. Ceramic substrates, such as a glass substrate formed in the front face and an alumina, etc. are used. the printed conductor which a general conductor is used as a material of the element electrodes 202 and 203, for example, consists of a metal, a metallic oxide, glass, such as metals, such as nickel, Cr, Au, Mo, W, Pt, Ti, aluminum, Cu, and Pd, or an alloy and Pd, Ag, Au and RuO2, and Pd-Ag, etc., and In2 O3-SnO2 etc. -- it is suitably chosen from semiconductor materials, such as a transparent conductor and contest polysilicon, etc.
[0024] The element electrode spacing L is thousands of A or hundreds of micrometers preferably. Moreover, the voltage impressed to element inter-electrode has a desirable method of a low, and since to produce with sufficient reappearance is demanded, a desirable element electrode spacing is 1 micrometer or 100 micrometers.
[0025] Several micrometers or hundreds of micrometers of element electrode length W are desirable from the resistance of an electrode, and the electron emission characteristic, and hundreds of A or several micrometers of the thickness of the element electrode 202,203 are desirable.
[0026] In addition, you may make it the composition in which the electrode of the conductive thin film 204 and the element electrode 202,203 was made to form one by one for example, on a substrate 201 besides the composition of drawing 4 .

[0027] In order to obtain the good electron emission characteristic, especially the particle film that consisted of particles is desirable, and although the thickness is suitably set up according to resistance, energization foaming conditions mentioned later between the step coverage to the element electrode 202,203, and the element electrode 202,203, the conductive thin film 204 is several angstroms or thousands of A preferably, and is 10A or 500A especially preferably. The sheet resistance is 103. Or 107 They are an ohm/**.

[0028] The material which constitutes the conductive thin film 204 Moreover, Pd, Pt, Ru, Ag, Metals, such as Au, Ti, In, Cu, Cr, Fe, Zn, Sn, Ta, W, and Pd, PdO, SnO2, In 2O3, PdO, and Sb 2O3 etc. -- an oxide -- HfB2, ZrB2, LaB6, CeB6, YB4, and GdB4 etc. -- semiconductors, such as nitrides, such as carbide, such as a boride, and TiC, ZrC, HfC, TaC, SiC, WC, and Tin, ZrN, HfN, and Si, germanium, carbon, etc. are mentioned

[0029] In addition, not only the state that the particle distributed separately but a particle gets down from the film in contiguity or the state (the shape of an island is also included) where it overlapped very mutually as the fine structure, the particle film described here is a film with which two or more particles gathered, and it is [the particle size of a particle is several angstroms or thousands of A, and] 10A or 200A preferably.

[0030] The electron emission section 205 is the crack of high resistance formed in a part of conductive thin film 204, and is formed of energization foaming etc. Moreover, in a crack, it may have particle size (several angstroms or hundreds of A) of a conductive particle. This conductive particle contains some [at least] elements of the matter which constitutes the conductive thin film 204. Moreover, the electron emission section 205 and the conductive thin film 204 of the near may contain carbon and a carbon compound.

[0031] Drawing 5 is the typical cross section showing the composition of a fundamental vertical-type surface conduction type electron emission element. In drawing 5 , 221 is the level difference formation section and has given the same sign about the same member as drawing 4 .

[0032] A substrate 201, the element electrodes 202 and 203, the conductive thin film 204, and the electron emission section 205 can consist of the same material as the flat-surface type surface conduction type electron emission element mentioned above. The level difference formation section 221 consists of insulating material, and the thickness of the level difference formation section 221 is equivalent to the element electrode spacing L of the flat-surface type surface conduction type electron emission element in drawing 4 described previously. The interval is hundreds of A or dozens of micrometers. Moreover, although the interval is controllable by the voltage impressed to the process of the level difference formation section 221, and element inter-electrode, it is hundreds of A or several micrometers preferably.

[0033] In order to form the conductive thin film 204 after the element electrode 202,203 and level difference formation section 221 production, the laminating of it is carried out on the element electrode 202,203. In addition, in drawing 5 , although it is indicated that the electron emission section 205 is formed in the level difference formation section 221 in the shape of a straight line, depending on production conditions, energization foaming conditions, etc., a configuration and a position are not restricted to this.

[0034] The example is shown and explained to drawing 6 although various methods can be considered as the manufacture method of the surface conduction type electron emission element of drawing 4 described previously. About the same member as drawing 4 , the same sign is given among drawing 6 .

[0035] 1) Deposit a substrate 201 by the detergent, pure water, and the organic solvent, and fully deposit an element electrode material by the vacuum deposition method, the spatter, etc. after washing. Then, patterning is carried out with photo lithography technology, and the element electrode 202,203 is formed on this substrate 201 [drawing 6 (a)].

[0036] 2) Form an organic-metal thin film by applying and leaving an organic-metal solution in the substrate 201 which formed the element electrode 202,203. An organic-metal solution here is a solution of the organometallic compound which uses as the main element the metal which forms the above-mentioned conductive thin film 204. Then, heating baking processing of the organic-metal thin film is carried out, patterning is carried out using well-known technology, such as a lift off and etching, and the conductive thin film 204 is formed [drawing 6 (b)]. In addition, although explained by the method of applying an organic-metal solution here, it may not restrict to this and you may form by a vacuum deposition method, a spatter, the modified chemical vapor deposition, the distributed applying method, the dipping method, the spinner method, etc.

[0037] 3) Then, perform energization processing called energization foaming. Energization foaming energizes from a non-illustrated power supply, makes the conductive thin film 204 break, deform or deteriorate locally, and makes the part to which structure was changed form between the element electrodes 202,203. This part made to change structurally locally is called electron emission section 205 [drawing 6 (c)].

[0038] The example of the voltage waveform of energization foaming is shown in drawing 7 . Especially a voltage waveform has a desirable pulse shape, and when impressing a voltage pulse, making [drawing 7 (a)] and a pulse height value increase when impressing continuously a voltage pulse with a fixed pulse height value, it has [drawing 7 (b)].

[0039] First, when a pulse height value is made into fixed voltage, [drawing 7 (a)] is explained. T1 and T2 in drawing 7 (a) are the pulse width and pulse separation of a voltage waveform. T1 is made into 1 microsecond - 10 ms, T2 is made into 10 microseconds - 100 ms, and the peak value (peak voltage at the time of energization foaming) of a triangular wave is suitably chosen according to the gestalt of a surface conduction type electron emission element, and is impressed from several seconds for number 10 minutes under a suitable degree of vacuum, for example, the vacuum atmosphere of about 10 to 5 torrs. In addition, the wave impressed to inter-electrode [of an element] is not limited to a triangular wave, for example, may use the wave of requests, such as a square wave.

[0040] T1 and T2 in drawing 7 (b) -- drawing 7 (a) -- the same -- the peak value (peak voltage at the time of energization foaming) of a triangular wave -- 0.1 [for example,] -- you make it increase about V steps at a time, and it impresses under a suitable vacuum atmosphere Energization foaming in this case is the voltage of the grade which does not break locally and does not transform the conductive thin film 204 into pulse separation T2, for example, about [0.1V] voltage, and when element current is measured, and resistance is calculated, for example, resistance beyond 1M ohm is shown, it is taken as an energization foaming end.
[0041] 4) It is desirable to perform processing called activation process to the element which energization foaming next ended. An activation process is the degree of vacuum of about 10-4 to 10 to 5 torrs, and it is the processing to which the carbon and the carbon compound which a pulse height value is the thing of processing which repeats and impresses a fixed voltage pulse, and originate in the organic substance which exists in a vacuum are made to deposit on an electric conduction thin film, and element current If and the emission current Ie are remarkably changed like energization foaming. An activation process is ended when the emission current Ie is saturated, for example, measuring element current If and the emission current Ie. Moreover, as for the voltage pulse to impress, it is desirable to carry out by driver voltage of operation. Carbon and a carbon compound are graphite (both ** and polycrystal are pointed out) and amorphous carbon (mixture with amorphous carbon and polycrystal graphite is pointed out), and the thickness has desirable 500A or less, and they are 300A or less more preferably here.
[0042] 5) In this way, it is desirable to carry out the drive of the produced electron emission element of operation under the atmosphere of a degree of vacuum higher than the degree of vacuum in an energization foaming process and an activation process. Furthermore, the 80 degrees C - 150 degrees C thing to do for an after [heating] operation drive is desirable under the atmosphere of a high degree of vacuum. Here, it is about ten to six or more degree of vacuums, and a degree of vacuum higher than an energization foaming process and the degree of vacuum which carried out activation is an ultra-high-vacuum system more preferably, and is a degree of vacuum which carbon and a carbon compound newly deposit hardly on an electric conduction thin film. It becomes possible by carrying out like this to stabilize element current If and the emission current Ie.
[0043] Drawing 8 is the outline block diagram showing an example of the measurement evaluation equipment for measuring the electron emission characteristic of an element which has the composition shown by drawing 4 . In drawing 8 , the same sign as drawing 4 shows the same thing. Moreover, the power supply for 251 impressing the element voltage Vf to an electron emission element, The ammeter for 250 measuring the element current If which flows the conductive thin film 204 between the element electrodes 202,203, The anode electrode for 254 catching the emission current Ie emitted from the electron emission section 205 of an element, As for the ammeter for the high voltage power supply for 253 impressing voltage to the anode electrode 254 and 252 measuring the emission current Ie emitted from the electron emission section 205 of an element, and 255, vacuum devices and 256 are exhaust air pumps.
[0044] Next, the image formation equipment of this invention is described.
[0045] The electron-source substrate used for image formation equipment is formed by arranging two or more surface conduction type electron emission elements on a substrate. A surface conduction type electron-emission element is arranged to the method of the array of a surface conduction type electron emission element in parallel, and the ladder type arrangement (the following carries out and calls it a mold arrangement electron-source substrate) which connects the ends of each element with wiring, and the simple matrix arrangement (it is called below a matrix type arrangement electron-source substrate) which connected the direction wiring of X and the direction wiring of Y to the element electrode of the couple of a surface conduction type electron emission element, respectively are mentioned to it In addition, the control electrode (grid electrode) which is an electrode which controls flight of the electron from an electron emission element is needed for the image formation equipment which has a ladder type arrangement electron-source substrate.
[0046] The simple matrix type arrangement electron-source substrate constituted based on this principle below is explained using drawing 9 . For an electron-source substrate and 272, as for the direction wiring of Y, and 274, in drawing 9 , the direction wiring of X and 273 are [271 / a surface conduction type electron emission element and 275] connection. The surface conduction type electron emission element 274 may be whichever of the flat-surface type mentioned above or a vertical type. The substrate used for the electron-source substrate 271 is a glass substrate mentioned above, and a configuration is suitably set up according to a use.
[0047] The direction wiring 272 of X of m consists of Dx1, Dx2, ..., Dxm, and the direction wiring 273 of Y consists of wiring of n of Dy1, Dy2, ..., Dyn. Moreover, material, thickness, and wiring width of face are suitably set up so that almost equal voltage may be supplied to many surface conduction type electron emission elements 274. Between the direction wiring 272 of X and the direction wiring 273 of Y of n of these m, it is electrically separated by the non-illustrated layer insulation layer, and matric wiring is constituted (both m and n are a positive integer). A non-illustrated layer insulation layer is formed in the field of the whole surface of the substrate 271 in which the direction wiring 272 of X was formed, or in part a request. The direction wiring 272 of X and the direction wiring 273 of Y are pulled out as an external terminal, respectively. Furthermore, the element electrode (not shown) of the surface conduction type electron emission element 274 is electrically connected with the direction wiring 272 of X of m, and the direction wiring 273 of Y of n by connection 275. Moreover, you may form the surface conduction type electron emission element 274 in whichever on a substrate or a non-illustrated layer insulation layer.
[0048] Although mentioned later in detail, the direction wiring 272 of X is electrically connected with a scanning signal generation means by which it does not illustrate [which impresses the scanning signal for scanning the line of the surface conduction type electron emission element 274 arranged in the direction of X according to an input signal], and it is ********. On the other hand, the direction wiring 273 of Y is electrically connected with a modulating-signal generating means by which it

does not illustrate [which impresses the modulating signal for modulating each train of the train of the surface conduction type electron emission element 274 arranged in the direction of Y according to an input signal].
[0049] Furthermore, the driver voltage impressed to each element of the surface conduction type electron emission element 274 is supplied as difference voltage of the scanning signal impressed to an element, and a modulating signal. In such composition, only with simple matrix wiring, an individual element is chosen and a drive becomes independently possible.
[0050] Next, the image formation equipment using this matrix type arrangement electron-source substrate is explained using drawing 10 , drawing 11 , and drawing 12 . Drawing 10 is the basic block diagram of image formation equipment, drawing 11 (a) and (b) are drawings showing the example of composition of a fluorescent screen, respectively, and drawing 12 is a drive circuit block diagram for displaying according to the television signal of an NTSC color TV system.
[0051] In drawing 10 , the electron-source substrate to which 271 produced the electron emission element on the substrate, the rear plate with which 281 fixed the electron-source substrate 271, the face plate by which, as for 286, the fluorescent screen 284 and the metal back 285 grade were formed in the inside of a glass substrate 283, and 282 are housings, and an envelope 288 is constituted by these members. 276 is equivalent to the electron emission section 205 in drawing 4 . 272,273 is the direction wiring of X and the direction wiring of Y which were connected with the element electrode of the couple of a surface conduction type electron emission element.
[0052] Although constituted from a face plate 286, a housing 282, and a rear plate 281 like ****, since the rear plate 281 is formed in order to mainly reinforce the intensity of the electron-source substrate 271, when [sufficient by electron-source substrate 271 the very thing] it has the degree of strength, the rear plate 281 of another object is unnecessary [the envelope 288]. That is, the direct housing 282 may be formed in the electron-source substrate 271, and an envelope 288 may consist of a face plate 286, a housing 282, and an electron-source substrate 271.
[0053] The fluorescent screen 284 of a face plate 283 is shown in drawing 11 in detail. In drawing 11 , 292 is a fluorescent substance and 291 is black electric conduction material. Although a fluorescent substance 292 consists only of a fluorescent substance in the case of monochrome, in the case of the fluorescent screen of a color, it consists of the black electric conduction material 291 and fluorescent substances 292 which are called a black stripe or black matrix by the array of a fluorescent substance. The purposes in which a black stripe and a black matrix are prepared are it not being conspicuous and carrying out color mixture etc. by distinguishing by different color between each fluorescent substance 292 of the three-primary-colors fluorescent substance which is needed in the case of color display with, and making the section black, and suppressing the fall of the contrast by the outdoor daylight reflection in a fluorescent screen 284. There is only no material which makes a principal component the graphite usually well used as a material of a black stripe, and there is conductivity, and if transparency and reflection of light are a few material, it will not restrict to this. The method of applying a fluorescent substance to a glass substrate 283 is not based on monochrome and a color, but a precipitation method and print processes are used.
[0054] Moreover, the metal back 285 (drawing 10) is usually formed in the inside side of a fluorescent screen 284 (drawing 10). The metal back's 285 purpose has protection of the fluorescent substance from the damage by the collision of the anion generated within acting as an electrode for impressing raising brightness and electron beam acceleration voltage and the envelope 288 etc. by carrying out specular reflection of the component of the light which goes to an inside side among the luminescence components of a fluorescent substance to a face plate 286 side. The metal back 285 performs data smoothing (usually called filming) of the inside side front face of a fluorescent screen 284 after fluorescent-screen 284 production, and it can produce by depositing aluminum (aluminum) in a vacuum deposition method etc. after that.
[0055] And on a face plate 286, electric conduction membrane layer 5 grade as shown in drawing 1 - drawing 3 is prepared further.
[0056] The interior is exhausted through a non-illustrated exhaust pipe, and an envelope 288 is made into the degree of vacuum which is about 10 to 7 torrs, and is closed. Moreover, getter processing may be performed in order to maintain the degree of vacuum after closure of an envelope 288. This is processing which heats the getter beforehand arranged by the heating methods, such as resistance heating or high-frequency heating, after closure at the position in an envelope 288 (not shown) just before closing an envelope 288, and forms a vacuum evaporationo film in an envelope inside. Ba etc. is usually a principal component and a getter maintains the degree of vacuum of for example, 1x10-5torr or 1x10-7torr by the absorption of this vacuum evaporationo film. In addition, the process after foaming of a surface conduction type electron emission element is set up suitably.
[0057] There is only no material made into a principal component, and there is conductivity, and if transparency and reflection of light are a few material, it will not restrict to this. The method of applying a fluorescent substance to a glass substrate 283 is not based on monochrome and a color, but a precipitation method and print processes are used.
[0058] Moreover, the metal back 285 (drawing 10) is usually formed in the inside side of a fluorescent screen 284 (drawing 10). The metal back's 285 purpose has protection of the fluorescent substance from the damage by the collision of the anion generated within acting as an electrode for impressing raising brightness and electron beam acceleration voltage and the envelope 288 etc. by carrying out specular reflection of the component of the light which goes to an inside side among the luminescence components of a fluorescent substance to a face plate 286 side. The metal back 285 performs data smoothing (usually called filming) of the inside side front face of a fluorescent screen 284 after fluorescent-screen 284 production, and it can produce by depositing aluminum (aluminum) in a vacuum deposition method etc. after that.
[0059] And on a face plate 286, electric conduction membrane layer 5 grade as shown in drawing 1 - drawing 3 is prepared further.
[0060] The interior is exhausted through a non-illustrated exhaust pipe, and an envelope 288 is made into the degree of vacuum

which is about 10 to 7 torrs, and is closed. Moreover, getter processing may be performed in order to maintain the degree of vacuum after closure of an envelope 288. This is processing which heats the getter beforehand arranged by the heating methods, such as resistance heating or high-frequency heating, after closure at the position in an envelope 288 (un-illustrating) just before closing an envelope 288, and forms a vacuum evaporationo film in an envelope inside. Ba etc. is usually a principal component and a getter maintains the degree of vacuum of for example, 1x10-5torr or 1x10-7torr by the absorption of this vacuum evaporationo film. In addition, the process after foaming of a surface conduction type electron emission element is set up suitably.

[0061] Next, in the image formation equipment constituted using the matrix type arrangement electron-source substrate, the outline composition of the drive circuit for performing a television display based on the television signal of an NTSC color TV system is explained using the block diagram of drawing 12 . drawing 12 -- setting -- 301 -- image formation equipment (display panel) -- it is -- 302 -- for a shift register and 305, line memory and 306 are [a scanning circuit and 303 / a control circuit and 304 / a modulating-signal generator, and Vx and Va of a synchronizing signal separation circuit and 307] direct current voltage supplies

[0062] Hereafter, the function of each part is explained. Image formation equipment 301 is connected with the external electrical circuit through a terminal Dox1 or Doxm and a terminal Doy1 or Doyn, and a secondary terminal Hv. among these, the surface conduction type electron emission elements by which matrix wiring was carried out at the letter of a matrix of the electron source prepared in a terminal Dox1 or Doxm at image formation equipment 301, i.e., an M line N train, -- every [a party (N elements)] -- the scanning signal for driving one by one is impressed On the other hand, the modulating signal for controlling the output electron beam of each element a party's surface conduction type electron emission element chosen by the scanning signal is impressed to a terminal Dy1 or Dyn. Moreover, although the direct current voltage of 10 [kV] is supplied to a secondary terminal Hv from direct current voltage supply Va, this is the acceleration voltage for giving sufficient energy exciting a fluorescent substance to the electron beam outputted from a surface conduction type electron emission element.

[0063] Next, a scanning circuit 302 is explained. This circuit equips the interior with M switching elements, and each switching element chooses the output voltage of direct current voltage supply Vx, or either of 0 [V] (grand level) (S1 or Sm shows typically among drawing), and it connects with the terminal Dx1 of a display panel 301, or Dxm electrically. Although each switching element of S1 or Sm operates based on the control signal Tscan which a control circuit 303 outputs, it can be constituted by combining an actual for example, switching element like FET. In addition, the direct-current-voltage power supply Vx is set up so that fixed voltage which the driver voltage impressed to the element which is not scanned based on the property (electron emission threshold voltage) of a surface conduction type discharge element turns into below electron emission threshold voltage may be outputted.

[0064] A control circuit 303 has the work which adjusts operation of each part so that a suitable display may be performed based on the picture signal inputted from the exterior. And based on the synchronizing signal Tsync sent from the synchronizing signal separation circuit 306 explained below, each control signal of Tscan, Tsft, and Tmry is generated to each part.

[0065] The synchronizing signal separation circuit 306 is a circuit for separating a synchronizing signal component and a luminance-signal component from the television signal of an NTSC color TV system inputted from the outside, and can be constituted using a frequency-separation (filter) circuit. The synchronizing signal separated by the synchronizing signal separation circuit 306 was illustrated as a Tsync signal after [expedient] explaining here, although it consisted of a vertical synchronizing signal and a horizontal synchronizing signal so that it might be known well. On the other hand, this signal is inputted into a shift register 304 although the luminance-signal component of the picture separated from the television signal is expressed as a DATA signal for convenience.

[0066] A shift register 304 is for carrying out serial/parallel conversion of the DATA signal inputted serially for every line of a picture, and operates based on the control signal Tsft sent from a control circuit 303. That is, you may put it in another way as a control signal Tsft being the shift clock of a shift register 304. The data for the picture of one line by which serial/parallel conversion was carried out (it is equivalent to the drive data for N electron emission elements) are outputted from a shift register 304 as N parallel signals of Id1 or Idn.

[0067] The line memory 305 is the storage for during required time memorizing the data for the picture of one line, and memorizes the contents of Id1 or Idn suitably according to the control signal Tmry sent from a control circuit 303. The memorized contents are outputted as Id'1 or Id'n, and are inputted into the modulating-signal generator 307.

[0068] The modulating-signal generator 307 is a source of a signal for carrying out the drive modulation of each of a surface conduction type electron emission element appropriately according to each of image data Id'1 or Id'n, and the output signal is impressed to the surface conduction type electron emission element in a display panel 301 through a terminal Doy1 or Doyn.

[0069] The electron emission element in this invention has the following basic properties to the emission current Ie. That is, there is clear threshold voltage Vth in electron emission, and only when the voltage more than Vth is impressed, electron emission arises. Moreover, to the voltage more than an electron emission threshold, the emission current also changes according to change of the applied voltage to an element. In addition, although the degree of change of the emission current to the value and applied voltage of the electron emission threshold voltage Vth may change by changing the material of an electron emission element, and composition and the manufacture method, the following can be said anyway.

[0070] That is, an electron beam is outputted when impressing panel-like voltage to this element (for example, although electron emission is not produced even if it impresses the voltage below an electron emission threshold when impressing the voltage more than an electron emission threshold). It is possible in that case to control the intensity of an output electron beam by changing the peak value Vm of a pulse in the first place. It is possible to control the total amount of the charge of the electron beam outputted

to the second by changing the width of face Pw of a pulse.
[0071] Therefore, according to an input signal, a voltage modulation technique, pulse width modulation, etc. are held as a method which modulates an electron emission element. The circuit of a voltage modulation technique which modulates the peak value of a pulse suitably according to the data inputted although the voltage pulse of fixed length is generated as a modulating-signal generator 307 when carrying out a voltage modulation technique is used. Moreover, the circuit of pulse width modulation which modulates the width of face of a voltage pulse suitably according to the data inputted although the voltage pulse of fixed peak value is generated as a modulating-signal generator 307 when carrying out pulse width modulation is used.
[0072] Television can be displayed by a series of operation explained above, using the picture form formation equipment 301 of this invention as a display panel. in addition -- although not indicated especially during the above-mentioned explanation -- a shift register 304 and the line memory 305 -- the thing of a digital signal formula -- an analog signal formula -- even when -- it does not interfere In short, serial/parallel conversion of a picture signal and storage should just be performed at the rate of predetermined.
[0073] Although it is necessary to digital-signal-ize the output signal DATA of the synchronizing signal separation circuit 306 when using a digital signal formula, this is possible if the output section of 306 is equipped with an A/D converter. Moreover, the circuit where the output signal of the line memory 305 is used for the modulating-signal generator 307 by the digital signal or the analog signal in relation to this becomes a different thing a little.
[0074] First, the case of a digital signal is described. What is necessary is just to add an amplifying circuit etc. to the modulating-signal generator 307 if needed using the D/A-conversion circuit known well, for example in a voltage modulation technique. Moreover, in the case of pulse width modulation, it can constitute by using the circuit which combined the comparator (comparator) which compares with the output value of memory the output value of the counter (counter) which carries out counting of the wave number which high-speed VCO and VCO output to the modulating-signal generator 307, and a counter. You may add the amplifier for amplifying the voltage of the modulating signal which a comparator outputs if needed and by which PDM was carried out even to the driver voltage of a surface conduction type electron emission element.
[0075] Next, an analog signal case is described. In a voltage modulation technique, you may add a level shift circuit etc. to the modulating-signal generator 307 if needed that what is necessary is just to use the amplifying circuit using the operational amplifier known well, for example. Moreover, in the case of pulse width modulation, you may add the amplifier for ****** being good and amplifying the voltage of the armature-voltage control oscillator circuit (VCO) known well, for example even to the driver voltage of a surface conduction type electron emission element if needed.
[0076] Through the container outer edge child Dox1 or Doxm, Doy1, or Doyn, by impressing voltage, an electron is made to emit, and high pressure can be impressed to the metal back 285 or a transparent electrode (not shown) through a secondary terminal Hv, an electron beam can be accelerated for each electron emission element, it can be made to be able to collide with a fluorescent screen 284 for it, and a picture can be displayed on it by making light excite and emit in the image formation equipment completed as mentioned above.
[0077] The composition described above is outline composition required when producing the suitable image formation equipment used for a display etc., for example, detailed portions, such as material of each part material, are not restricted to the above-mentioned contents, and they are suitably chosen so that it may be suitable for the use of image formation equipment. Moreover, as an input signal, although the NTSC color TV system was held, it may not restrict to this, and many methods, such as PAL and an SECAM system, may be used, and TV signal (for example, high-definition TV including MUSE) method which consists of much scanning lines rather than this may be used.
[0078] Next, the above-mentioned ladder type arrangement electron-source substrate and the image formation equipment using it are explained using drawing 13 and drawing 14 .
[0079] In drawing 13 , it is the common wiring which 310 connects an electron emission element, and Dx1-Dx10 of 312 to an electron-source substrate, and connects 311 to the aforementioned electron emission element. Two or more electron emission elements 311 are allotted in parallel with the direction of X on the substrate 310 (this is called element line). Two or more these element lines are arranged on a substrate, and it becomes a ladder type electron-source substrate. By impressing driver voltage suitably between common wiring of each element line, it becomes possible to drive each element line independently. Namely, what is necessary is just to impress the voltage below an electron emission threshold to the element line which does not make an electron beam emit the voltage more than an electron emission threshold to the element line to which an electron beam is made to emit. Moreover, you may carry out common wiring Dx2-Dx9 (for example, Dx2 and Dx3) of each element spacing to the same wiring.
[0080] Drawing 14 is the outline block diagram showing an example of the structure of image formation equipment equipped with the electron source of ladder type arrangement. G1, G2, and ... by which the hole for a grid electrode passing 320 and an electron passing 321, the container outer edge child which 322 becomes from Dox1, Dox2, ..., Doxm, and 323 were connected with the grid electrode 320 -- the container outer edge child who consists of Gn, and 310 are the electron-source substrates which considered common wiring of each element spacing as the same wiring as mentioned above In addition, the same sign as drawing 10 shows the same member. The difference from the image formation equipment (drawing 10) of the above-mentioned simple matrix arrangement is having the grid electrode 320 between the electron-source substrate 310 and a face plate 286.
[0081] The grid electrode 320 can modulate the electron beam emitted from the surface conduction type electron emission element, and in order to make the electrode of the shape of a stripe established by intersecting perpendicularly with the element line of ladder type arrangement pass an electron beam, corresponding to each element, the hole 321 circular one piece at a time is

formed. The configuration and installation position of a grid are [necessarily like drawing 14] good, and since they prepare many passage mouths in the shape of a mesh as opening, you may prepare them the circumference and near for example, the surface conduction type discharge element. The container outer edge child 322 and the grid container outer edge child 323 are electrically connected with the non-illustrated control circuit.

[0082] By impressing the modulating signal for the picture of one line to a grid electrode train simultaneously synchronizing with driving one train of element lines at a time one by one (scan), the irradiation to the fluorescent substance of each electron beam can be controlled, and it can express the picture of one line at a time as this image formation equipment.

[0083] As mentioned above, although the image formation equipment using the surface conduction type electron emission element was explained, this invention is not limited to this but cold cathode electron sources, such as for example, an MIM type electron emission element and a field emission type electron emission element, and its source of a thermoelectron are also usable as an electron emission element.

[0084] The image formation equipment of this invention fits not only the display of television broadcasting mentioned above but display, such as a video conference system and a computer. Furthermore, it can use also as image formation equipment as an optical printer which consisted of photosensitive drums etc.

[0085]

[Example] Hereafter, an example explains this invention still in detail.

[0086] The image formation equipment shown in <example 1> drawing 1 and drawing 2 was produced as follows.

[0087] First, the frit 4 for sealing was fixed with the fixture for fixation (not shown), baking sealing of the electron-source substrate 1, a face plate 2, and the housing 3 was carried out at predetermined temperature, and the envelope 6 was produced. Subsequently, it crosses all over the field of the outside of a face plate 2, and is Bi 2O3 of 8nm or more of thickness. The spatter film was prepared and it considered as the ground film 8. Subsequently, the spatter of the Au was carried out to up to the ground film 8, and it annealed at 200 to 300 degrees C, and considered as the transparent metal membrane 9 of 15nm of thickness. The lattice defect, the occluded gas, etc. were removed by this annealing, and thermal conductivity improved by about 4 times. Subsequently, it is Bi 2O3 on the transparent metal membrane 9. The film was formed and it considered as the upper film 10 of 45nm of thickness. Thus, the permeability of the light field of the transparent electric conduction membrane layer 5 of 70nm of formed sum total thickness was 80% or more. Furthermore, image formation equipment was completed by adding the drive circuit explained previously.

[0088] Thus, without degrading the luminosity and quality of image of a display image greatly, the heat generated with a fluorescent substance was promptly conducted in the face plate side, temperature was equalized, and the efficiency of image formation equipment obtained of the heat dissipation in a face plate also improved further. Therefore, lightweight-izing of making thickness of a structural member thin is possible.

[0089] The electric conduction membrane layer 11 of fields other than image formation field 7 of the <example 2> face plate 2 was made thicker than the transparent electric conduction membrane layer 5 of the image formation field 7 of a face plate 2, namely, image formation equipment was produced like the example 1 except having set thickness of the transparent metal membrane 9 to 700nm. This image formation equipment showed equalization of still better temperature distribution, and improvement in heat dissipation efficiency.

[0090] The image formation equipment shown in <example 3> drawing 3 was produced as follows.

[0091] An envelope 6 and the transparent electric conduction membrane layer 5 are formed like an example 2. first, further The thick electric conduction membrane layer 11 same on the outside side of a face plate 2, the side and the outside side of a housing 3, and the side except the image formation field 7 as an example 2 is formed. It fixed, as the adhesives (not shown) applied thinly showed a radiation fin 12 to drawing 3 , and image formation equipment was completed by adding the drive circuit explained further previously. This image formation equipment showed equalization of still better temperature, and improvement in heat dissipation efficiency.

[0092] <Example 4> discharge-in-gases type image formation equipment (not shown) was produced as follows.

[0093] First, the electronic drawer electrode for allotting the discharge electrode which occurs electric discharge plasma on a glass tooth-back board, next pulling out an electron from electric discharge plasma has been arranged. This drawer electrode consists of a metal plate which has the bore of regular a large number. Furthermore, the control electrode which consists of a band-like electrode group attached on the insulating base of a tabular has been arranged. In this control electrode, it has a bore on the bore on the aforementioned electronic drawer electrode, and the same axle, and electronic rectilinear propagation is barred. Then, the glass face plate to which the fluorescent screen is attached has been arranged so that the drawer electrode and parallel which were formed on the electron-source substrate may be faced, and it was sealed in the low melting glass. And evacuation in image formation equipment was performed and discharge-in-gases type image formation equipment was manufactured by enclosing the rare gas of a low pressure. Furthermore, the same transparent electric conduction membrane layer as an example 1 was prepared. The same effect was acquired also in this image formation equipment.

[0094]

[Effect of the Invention] since according to this invention the temperature in a face plate can be equalized and the thermolysis effect can be further improved in the image formation equipment using the electron emission element (especially surface conduction type electron emission element) as explained above, generating of thermal stress can be suppressed, and it is comparing with conventional equipment, and sheet-metal[lightweight-izing and]-izing is possible Therefore, especially the image formation equipment of this invention is very useful as lightweight-izing and plate [which was sheet-metal-ized]-like

image formation equipment.

[Translation done.]